Greening Our Grounds

Pacific Northwest National Lab

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Pacific Northwest National Laboratory (PNNL) Location

We are located in the South Central area of Washington State.

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What We Did

- Reduced irrigation water usage by over 35% per season
- Saved nearly 30% in electricity per season from our irrigation pumps
- Learned how to improve the health of our trees and lawns while saving water
- Learned to apply science to our landscaping challenges

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A Little History

- PNNL began research operations 35 years ago.
- The site landscaping includes a tree-lined campus, extensive shrub beds, and large lawns.

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Opportunity Knocks

- In 1999-2000 a project was launched to renovate and update PNNL's grounds.
- One of the objectives included replacing ageing plantings with more native, water efficient types.
- Other methods were also investigated to reduce water consumption and enhance sustainability and drought resistance.

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New Ideas Take Root

Aged, water thirsty plants are being replaced with native plants which require less water and are more disease resistant.

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Water Savings on the Tree Lines

The tree lines consist of over 580 mature London Plane Sycamore trees that define the campus borders.

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Water Savings on the Tree Lines

- The tree lines used a bubbler type watering system.
- This system discourages proper root growth and can impact the health of the tree.

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Water Savings on the Tree Lines

- The bubbler system was designed using manual valves located great distances from adjoining facilities.
- The system was labor intensive and wasteful.

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Water Savings on the Tree Lines

We replaced the bubblers with impact sprinklers. This provides greater control over water deposition and encourages proper tree root growth.

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Water Savings on the Tree Lines

We also replaced the manual valves with self-contained, battery operated, timer control valves.

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Water Savings on the Tree Lines

Bottom Line:

- Water savings is over 45% per season.
- Trees are developing healthy, more drought resistant root systems.
- Green Belt under the trees also controls dust and helps retain moisture.

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Next: Looking at the Lawn

- First, we learned about turf.
- We learned our turf was in poor condition and required ever increasing amounts of water to maintain an attractive appearance.

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Looking Under the Lawn

We learned that through frequent, shallow watering we had developed a very shallow turf root system which would not be disease or drought resistant.

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Repairing the Soil

We learned that by aerating and topdressing the soil we could reduce thatch buildup, improve water penetration, and encourage root growth.

Aerate: to loosen or "open" the soil. Similar to what a plow does without disturbing the lawn.

Topdressing: the application of clean sand to aerated turf. The sand allows water and air to reach the root zone.

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The Results in the Soil:

- Aeration and topdressing resulted in significant root growth in one season's time.
- Deep roots need less water.
- Savings: Over 20% reduction in irrigation on the turf!

Right: Turf Sample from 2000.

Note complete lack of deep roots.

Below: Turf Sample from 2001.

Note deep root development.

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Water Savings Driver

- The need to understand exactly what was happening with the irrigation system.
- The need to meet the regulatory requirements of our Water Right.
- Heightened visibility of water use due to drought condition.

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Understanding the System

- Very little documentation existed, most information in “tribal knowledge”.
- Drawings were outdated and unusable.
- We decided to perform a system by system evaluation.

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Methodology

- Each station was cycled from a clear zero to a solid flow, any anomaly required a repeat.
- Every 5th station was cycled 2 times as a data check.

Now, THAT'S dedication!

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Measurement Results:

- Real world flow data for each station.
- Many flow problems (broken heads, pipes) located and repaired.

36 Timers

283 Stations

Over 6300 sprinkler heads

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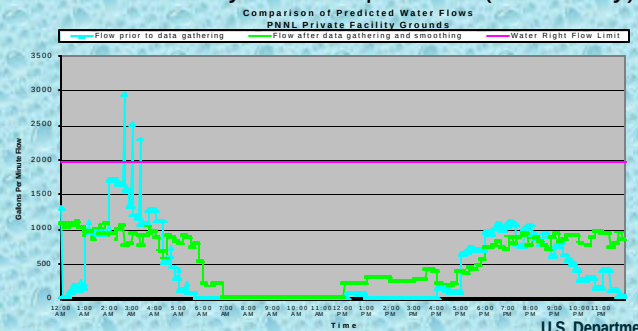
Before and After:

- Smoothing the flow allows better use of pumps and less stress on system components. (PNNL only)



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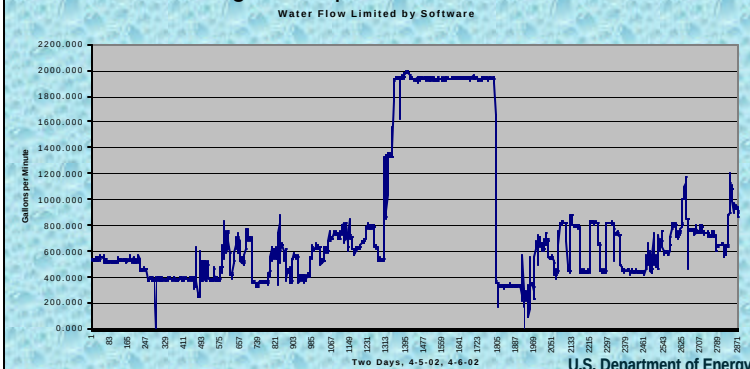
Software Control

- Software designed to prevent flows over allowance.



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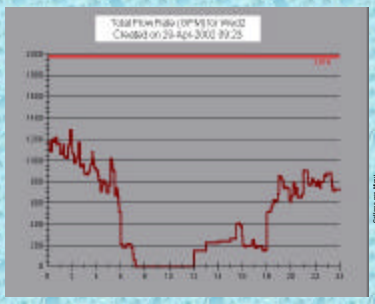
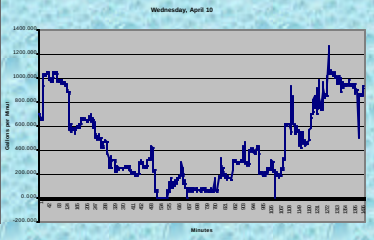
Predictive vs. Real

- Compare





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Conclusion:

- Understand water requirements of turf, trees, and shrubs.
- Look into replacement with more water efficient cultivars, especially in older landscapes.
- Understand soil conditions, both chemically and hydraulically.
- Perform real measurements, don't guess or use tribal knowledge.
- Question everything; procedures, practices, performance
- Don't be afraid to experiment, but document the results.

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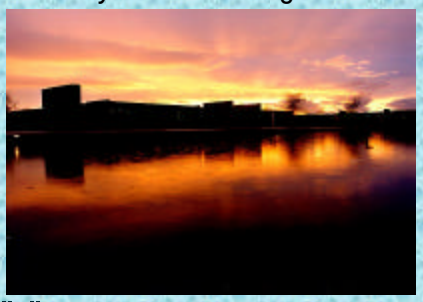
The End

- Water and electricity savings and a good looking, healthier landscape.

  We really are “Greening Our Grounds”!



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For more info:

www.pnl.gov/conserve-energy

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